

REMARKS/ARGUMENTS

Favorable reconsideration of this application as amended and in light of the following discussion is respectfully requested.

Claims 1-8 and 11-19 are presently active; Claims 20-49 have been withdrawn by a Restriction Requirement; Claims 9 and 10 have been canceled previously without prejudice; and Claim 1 has been presently amended.

In the final Office Action, Claims 1-8 and 13-19 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Jap. Pat. Application Publ. 08-031753 to Tashiro et al in view of U.S. Pub. No. 2003/0151372 to Tsuchiya et al. Claim 12 was rejected under 35 U.S.C. § 103(a) as being unpatentable over Tashiro et al in view of U.S. Pat. No. 5,441,596 to Nulty.

Applicants acknowledge with appreciation the courtesy of Examiner Arancibia to provide an English translation of Tashiro et al. This English translation of Tashiro et al is the document referenced below.

Claim 1 defines a first electrode that receives a first RF signal at a first RF frequency and a second RF signal at a second RF frequency so as to maintain the plasma while the first RF frequency of the first RF source is being changed to the second RF frequency of the first RF source, wherein the first RF frequency used to ignite the plasma is higher in frequency than the second RF frequency used to sustain the plasma.

Applicants submit that this feature patentably defines over Tashiro et al and Tsuchiya et al for at least the following reasons.

Firstly, the Office Action acknowledges on page 3, lines 3-5, that Tashiro et al do not teach the feature of the first RF frequency being greater than the second RF frequency. The Office Action asserts on page 2 that the motivation for modifying the method of Tashiro et al

was taught in Tsuchiya et al by their teachings in paragraphs 9-15, which the Office Action summarizes as to “increase plasma generation efficiency by igniting the plasma with a frequency in the VHF band, but to avoid weakening the sheath electric field by having the frequency too high during processing.”

Yet, this conclusion on motivation appears to disregard those parts of Tashiro et al that show the problems of starting a VHF plasma from a power supply to be used to drive (on the same electrode and thus with the same power supply) a lower frequency RF plasma. Further, this conclusion on motivation is based on the teachings in Tsuchiya et al which are directed frequencies being applied from different electrodes and different power supplies, and therefore the basis for the asserted motivation given in the Office Action is itself without the context of the problems in Tashiro et al. M.P.E.P. § 2143.01(II) states that

The test for obviousness is what the combined teachings of the references would have suggested to one of ordinary skill in the art, and all teachings in the prior art must be considered to the extent that they are in analogous arts. When the teachings of two or more prior art references conflict, the Examiner *must weigh the power of each reference to suggest solutions* to one of ordinary skill in the art, considering the degree to which one reference might accurately discredit another. [Emphasis added.]

It appears from the Advisory Action that the Examiner has not considered the degree to which the unreliability of the equipment as disclosed in Tashiro et al would discredit the general advantages of higher operational frequencies discussed in Tsuchiya et al. In Tashiro et al, it is stated at paragraphs [0015] – [0016]:

If the frequency is about 13.56 MHZ, the stray capacitance and the stray inductance are negligible, compared with $L/4$ and C_2 of the matching unit, however the frequency rises to a VHF region, the stray capacitance and the stray inductance cannot be ignored. In other words, if only the matching unit is employed, *matching is difficult due to the stray capacitance and the stray inductance*. In an actual VHF discharge, if condition (2) was met, the discharge start was very difficult. Furthermore, even if the discharge was carried out, the matching was difficult to be attained, and time was required for the matching.

For these problems, the discharge has been started by increasing the input power, and while attaining the matching, the power has been set to a prescribed value. However, in this method, *the overload to the power source* becomes a problem and there has been a limitation in the realization. Furthermore, since the film formation rate is vary fast, if *the time required until a stable discharge through the matching after the start of the discharge is long*, a film is deposited in the meantime, so that a uniform film has not been able to be formed or at least the initial film has been nonuniform. This is *a big problem* for manufacturing apparatuses in which the interface is an important requirement. [Emphasis added.]

Given the power equipment problems disclosed in Tashiro et al when igniting a plasma at VHF frequencies and their solution to start the plasma at lower frequencies and sustain at higher frequencies, Applicants submit that one of ordinary skill in the art (although having knowledge of the benefits to be gained from the teachings of Tsuchiya et al regarding the use of dual frequency plasma processing by *separate power supplies* and *separate electrodes*) would *not* have been motivated to use a single powered electrode from a single power source for high frequency plasma igniting and lower frequency plasma maintaining, as claimed.

In other words, when applied to a single powered electrode from a single power source for high frequency plasma igniting and lower frequency plasma maintaining, the practical power supply problems disclosed by Tashiro et al *out weigh* any potential benefit of VHF and then RF operation. Indeed, Tashiro et al later disclosed at paragraph [0063] a solution for a VHF discharge start, but that solution involves different electrodes for VHF and RF discharges.

Thus, Applicants submit that, when these considerations are weighed, the combined teachings of Tashiro et al and Tsuchiya et al do not lead one of ordinary skill in the art to modify Tashiro et al based on the generic principles expounded in Tsuchiya et al for operation at higher frequencies.

Secondly, the Supreme Court in *KSR International Co. v. Teleflex Inc. et al.* 2007 U.S.

LEXIS 4745 reinforced the role of *Graham* factors and teaching away in deciding obviousness.

The Court stated that:

In *United States v. Adams*, 383 U. S. 39, 40 (1966), a companion case to *Graham*, the Court considered the obviousness of a wet battery that varied from prior designs in two ways: It contained water, rather than the acids conventionally employed in storage batteries; and its electrodes were magnesium and cuprous chloride, rather than zinc and silver chloride. The Court recognized that when a patent claims a structure already known in the prior art that is altered by the mere substitution of one element for another known in the field, ***the combination must do more than yield a predictable result***. 383 U. S., at 50-51. It nevertheless rejected the Government's claim that Adams's battery was obvious. The Court relied upon the corollary principle that when the prior art ***teaches away*** from combining certain known elements, discovery of a successful means of combining them is more likely to be nonobvious. *Id.*, at 51-52. When Adams designed his battery, the prior art warned that risks were involved in using the types of electrodes he employed. The fact that the elements worked together in ***an unexpected and fruitful manner*** supported the conclusion that Adams's design was ***not obvious*** to those skilled in the art. [Emphasis added.]

In the present situation, the claimed method involving a single powered electrode and a single power source for high frequency plasma igniting and lower frequency plasma maintaining produces ***more than the predictable result*** which Tashiro et al shows to have been 1) difficult matching and 2) power supply overloading leading to "a big problem" for manufacturing apparatuses. In other words, the claimed method works in ***an unexpected and fruitful manner*** and therefore should be non-obvious based on these considerations.

Indeed, to avoid such problems, Tashiro et al teach away from the present invention by their use of a system having two separately powered electrodes driven by separate power supplies in order to strike at a lower RF frequency and maintain at a higher VHF frequency. See numbered paragraph [0025] of Tashiro et al.

Viewed differently, Applicants' position on this matter is consistent with a number of the *Graham* factors identified in M.P.E.P. § 2141 III as objective evidence of non-obviousness.

The failure of Tashiro et al to produce themselves the claimed invention due to the real and technical problems encountered represents *a failure of others* to produce the claimed invention.

The achieving of a system which ignites the plasma and thereafter provides to the first electrode from the first RF source a second RF signal at a second RF frequency (lower in frequency) so as to maintain the plasma while the first RF frequency of the RF source is being changed to the second RF frequency provides *an unexpected result* in that, based on the disclosure of Tashiro et al, one of ordinary skill in the art would **not** expect that a single electrode and a single power source could strike the plasma at a higher frequency and maintain the plasma as the frequency was being changed to a lower frequency.

Thirdly, the Advisory Action notes art reference U.S. Pat. No. 5,892,424 to Taylor et al. Similar to Tsuchiya et al, Taylor et al disclose advantages of higher frequency operation. Yet, the disclosure in Taylor et al referenced in the Advisory Action and shown in Figure 1 both indicate that there are two power supplies for separately powering the electrodes. Further, col. 7, lines 9-13, of Taylor et al make clear that the high frequency source 24 is disconnected and then the low frequency source 26 is connected. Thus, in Taylor et al, the problems discussed above for igniting and maintaining a plasma from a single power supply are avoided by the use of separate power supplies sequentially switched one for the other.

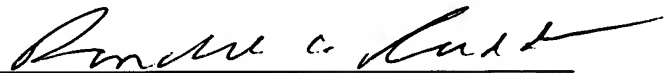
Hence, the teachings of Taylor et al, corroborate Applicants' position on this matter and show again the failure of another to produce the claimed invention and show again a teaching away from the claimed invention.

Conclusion: Thus, for all these reasons, it is respectfully submitted that Claim 1 and the claims dependent therefrom patentably define over Tashiro et al and Tsuchiya et al.

Consequently, in view of the present amendments and in light of the above discussions, the outstanding grounds for rejection are believed to have been overcome. The application as amended is believed to be in condition for formal allowance. An early and favorable action to that effect is respectfully requested.

Respectfully submitted,

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